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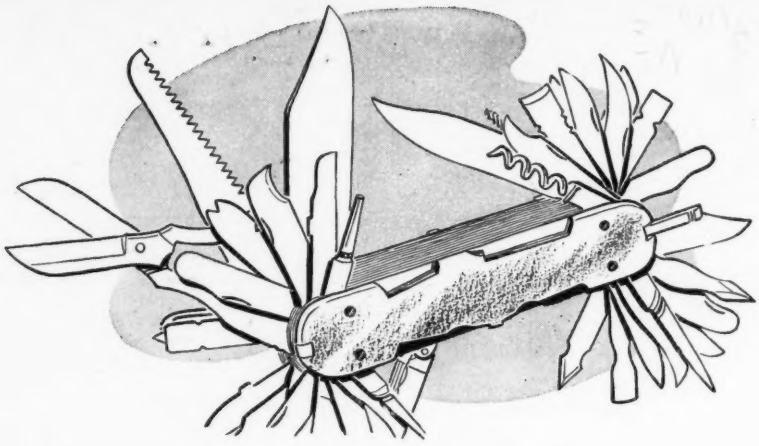

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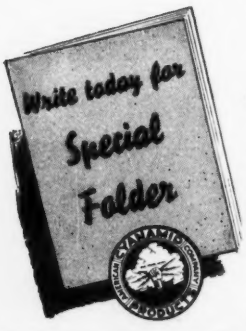

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VOLUME 29 NUMBER 20

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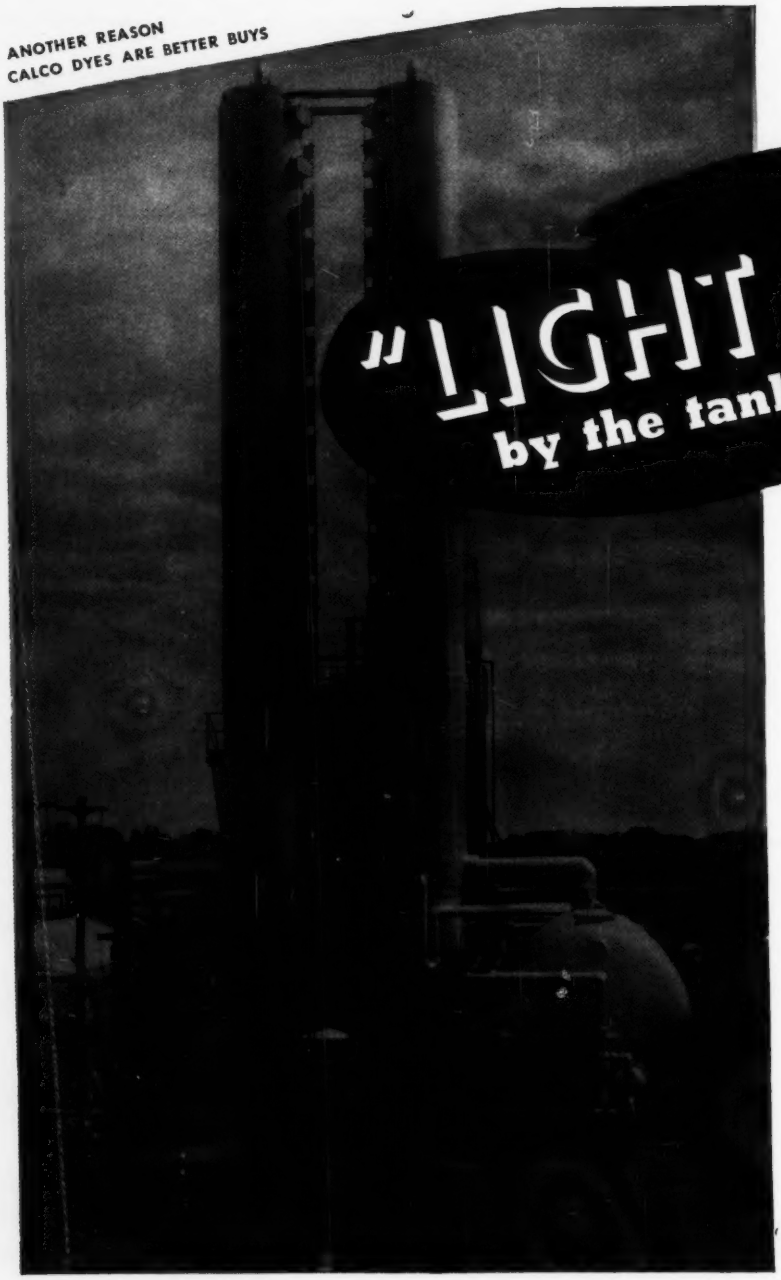

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DYESTUFF REPORTER

VOLUME 29 SEPTEMBER 30, 1940 NUMBER 20

Chitin Xanthate and Regenerated Chitin

C. J. B. THOR and W. F. HENDERSON

INTRODUCTION

IN A previous paper[1], it was pointed out that the existing literature on chitin contains no reference to chitin xanthate but merely states that chitin does not disperse by the viscose procedure. Mention was made of the fact that the authors have succeeded in preparing chitin xanthate. It is the purpose of this paper to describe a satisfactory method of preparation and to describe briefly the properties of a chitin xanthate dispersion, as well as the properties of chitin regenerated from such a dispersion.

A recent patent[2] describes a reaction product of deacetylated chitin and carbon disulfide but it is considered by the patentee that this is a carbamate rather than a xanthate, i.e., the carbon disulfide probably reacts with the free amino group rather than with an alcohol group.

PREPARATION OF CHITIN XANTHATE DISPERSION

Although chitin xanthate dispersions have been prepared under a variety of conditions in this laboratory, the method given below was found to be quite satisfactory.

Materials.—The chitin used was a flaky product prepared from shrimp waste by the method of Rigby[3]. When air-dried, the material contained 5-10 per cent moisture. The steep solution was prepared by diluting a rayon grade of 50 per cent sodium hydroxide liquor with distilled water. Carbon disulfide was of the usual grade used for commercial viscose production.

Method.—A quantity of the air-dried chitin flake sufficient to contain 450 grams of moisture-free chitin is steeped in 9 liters of 43 per cent sodium hydroxide at 25° C. or below for two hours. The steeping is preferably conducted under vacuum to facilitate penetration of the sodium hydroxide solution. The alkali chitin is pressed free of excess steep solution by any means which will give a cake weight approximately three times the weight of the chitin. A basket type centrifuge has been found to be a convenient means of pressing. The press cake is immediately broken up or shredded and mixed with such a quantity of chopped ice as will give a chitin content of 7 per cent, by weight, in the final mixture. A few minutes after mixing is begun, 170 g. of carbon disulfide are added. During the early stages of mixing, the temperature drops to about —10° C. and the alkali chitin gelatinizes, then disperses rapidly. The temperature is allowed to rise slowly to about 0° C. and is held at this level for a mixing period of four hours. It has been found that a two-gallon Werner-Pfleiderer type of jacketed mixer with sigma blades and supplied with cooling brine is convenient for carrying out the whole mixing operation. The resulting chitin xanthate dispersion should be stored at near 0° C. until it is used. If desired, the dispersion may be filtered under pressure through a conventional viscose filter sandwich, consisting of a layer of cotton batting supported by muslin, to remove small amounts of undissolved material. It may also be deaerated under vacuum. A chitin xanthate dispersion prepared as above will contain about 7.5 per cent total alkalinity calculated as sodium hydroxide, depending, of course, upon the efficiency of pressing of the alkali chitin.

If adequate mechanical mixing equipment is not available, mixing may be conducted intermittently by hand with a wooden stick in a well insulated vessel. Thus, one-third of the quantities listed above may be used and the alkali chitin, ice, and carbon disulfide may be mixed in a one-gallon thermos jug. In this case, after the four-hour dispersion-xanthation period, it is desirable to store the closed jug in a refrigerator for 12 to 18 hours, after which the dispersion is again mixed thoroughly.

PROPERTIES OF CHITIN XANTHATE DISPERSION

Chitin xanthate dispersions, prepared as described above, had viscosities comparable to the viscosities of viscose com-

*Contribution from the laboratories of the Visking Corporation, Chicago, Illinois. The first paper on this subject appeared in our issue of September 16, 1940.

[1]Thor and Henderson, American Dyestuff Reporter 29, 461, (1940).

[2]Haskins, U. S. Patent 2,202,003 (1940).

[3]Rigby, U. S. Patent 2,040,879 (1936).

monly in use in industry. The viscosity of the dispersion was influenced considerably by the method used to purify the original chitin. Thus, when the chitin was obtained from shrimp waste by treatment with cold acid and sodium hydroxide solutions, the xanthate mixture was gelatinous and did not become smoothly dispersed until the chitin content was brought considerably below 7 per cent. When this type of chitin was bleached by treatment with a solution of potassium permanganate followed by oxalic acid, a smooth xanthate dispersion could be prepared from it. On further bleaching of the original chitin, the viscosity of the resulting xanthate dispersion was still lower.

When a chitin xanthate dispersion is stored at room temperature, it will eventually set up to a firm gel, as does viscose, due to hydrolysis of the xanthate groups. A further reaction which occurs slowly during such storage is deacetylation of the chitin by the sodium hydroxide. It has been observed that chitin in the dispersed state is considerably more sensitive to deacetylation by dilute sodium hydroxide than is the original undissolved chitin flake. However, when the chitin xanthate dispersion is stored at 0° C. from the time of its preparation, no appreciable deacetylation occurs in a period of five days, and the time required for it to gel is extended considerably in comparison with the gel time for a dispersion stored at room temperature.

When chitin xanthate dispersion is mixed with an excess of acetic acid, the free xanthogenate is coagulated as a gelatinous precipitate which will re-dissolve in dilute sodium hydroxide solution. Similarly, sodium chitin xanthate coagulates out as a gel when chitin xanthate dispersion is treated with saturated sodium sulfate solution. This will re-dissolve when mixed with water or dilute aqueous sodium hydroxide.

Treatment of chitin xanthate dispersion with aqueous mineral acids results in the precipitation of regenerated chitin accompanied by the evolution of hydrogen sulfide, carbon disulfide, etc. Smooth, transparent, flexible films of regenerated chitin may be prepared from the xanthate dispersion in the following manner:

1. The filtered and deaerated xanthate dispersion is spread smoothly on a glass plate.
2. The plate is immersed in a coagulating bath consisting of 40 per cent ammonium sulfate and 5 per cent sulfuric acid in water. It is left in the bath for several minutes until regeneration is complete.
3. The film is washed in running water until free of acid and until the initial cloudiness has disappeared. This may be facilitated by a final wash in 1 per cent ammonium hydroxide.
4. If the film is to be dried, it is desirable to treat it with a softening agent such as glycerine. To do this, the film is immersed for about thirty minutes in 15 per cent aqueous glycerine, is blotted free of excess solution, and then allowed to dry, preferably after being stretched on a frame to prevent shrinkage. For the latter purpose, embroidery hoops serve as simple, convenient equipment.

The chitin xanthate dispersion may, also, be cast continuously through an orifice into a coagulating bath much in the same manner as viscose is cast to make shaped articles of regenerated cellulose.

Chitin xanthate dispersions are miscible in all proportions with regular viscose, and such mixtures may be used to cast formed articles consisting of an intimate mixture of regenerated cellulose and regenerated chitin in any desired proportion.

PROPERTIES OF REGENERATED CHITIN

Regenerated chitin films, prepared in the manner described above, behave very much in the same way as the original chitin toward swelling media and solvents. They are insoluble in water, dilute acids, dilute alkalies, and all neutral organic solvents, and to not gelatinize in any of these media. Determinations of the nitrogen content of several regenerated chitin films and of the original chitin flake indicate that no significant deacetylation occurs through the whole process of dispersion, xanthation, and regeneration. In the following table, these values are listed along with theoretical values for chitin and for completely deacetylated chitin.

Material	*% Nitrogen (dry basis)*
Chitin (theoretical)	6.90
Deacetylated Chitin (theoretical)	8.70
Chitin flake used in this study	6.56
Regenerated Chitin films	6.76
	6.61
	6.64

When treated with iodine-potassium iodide in dilute sulfuric acid, films of regenerated chitin become brown in color as does the original chitin flake. Deacetylated chitin, on the other hand, gives a deep violet color with this reagent. Films prepared from a chitin xanthate dispersion which has been stored at room temperature for several days instead of at 0°C. do give a violet color with the reagent. They, also, show other properties of deacetylated chitin, such as greatly decreased wet strength and the property of swelling in dilute acetic acid.

The tensile strength of regenerated chitin films in the dry condition is comparable with that of regenerated cellulose films prepared in the same manner from viscose. The wet strength, however, is definitely lower. The following tabulation gives approximate values of tensile strengths obtained on films of regenerated cellulose and of regenerated chitin cast under similar conditions.

Film	*Tensile strength* *lbs./in.²*	*kg./mm.²*
Regenerated Cellulose		
Dry	12,950	9.10
Wet	6,800	4.77
Regenerated Chitin		
Dry	13,510	9.49
Wet	2,500	1.75

Films of regenerated chitin resemble those of regenerated cellulose in many ways but differ from the latter in their affinity for dyestuffs. Films, consisting of regenerated cellulose, of regenerated chitin, and of an intimate mixture

of the two (prepared from a mixture of one part chitin xanthate and two parts cellulose xanthate) were soaked in several aqueous dye solutions, then washed in running water until free of excess dye. Basic dyestuffs, such as Methyl Violet 2B, and Fuchsine Y, were retained to a considerable degree by the cellulose but not by the chitin. Acidic dyestuffs, such as Eosine BS, Sodium Indigo Sulfonate, and Ponceau SX, were retained by the chitin but not by the cellulose. The mixed film retained both types to a considerable degree.

SUMMARY

Dispersions of chitin xanthate have been prepared and a satisfactory method for such preparation is given. Articles of regenerated chitin made from chitin xanthate are described and compared with similar articles of regenerated cellulose.

Abstracts

of Some of the Papers Presented at the Meeting of the American Chemical Society, Detroit, Michigan, September 9-13, 1940

Electrophoretic Studies of Cotton as Related to Its Acidic Properties

Milton Harris and Arnold Sookne, Textile Foundation Research Associateship at the National Bureau of Standards

The electrophoretic technique has been used in an investigation conducted by research associates for the Textile Foundation at the National Bureau of Standards for the purpose of studying changes in surface characteristics of cotton resulting from various treatments, and to relate these changes to the changes in acidity as determined by titration methods.

Samples of dewaxed cotton, cotton which has been depectinized by treatment with a boiling 1 per cent solution of sodium hydroxide for 2, 4, 8, and 16 hours, and pectic substance gave widely different pH-mobility curves. The curves for pectic substance is characteristic of a highly acidic material, whereas that of depectinized cotton shows a low order of acidity. The curve for dewaxed cotton lies approximately midway between the first two and appears to be a composite of the curves for cellulose and pectic substance.

Treatment of dewaxed cotton for 2 hours with a boiling 1 per cent solution of sodium hydroxide yielded a sample whose pH-mobility curve was considerably shifted to higher pH values (nearly 2 pH units), indicating a large loss of acidic substance. Similar treatments for 4 and 8 hours produced only slight further shifts but no further changes were apparent on still longer treatment.

Direct estimation of the acidic groups of the various samples by uronic acid analyses and by titration with Ag^{+} and Ca^{++} lead to the conclusion that all measurable quantities of pectic substance are removed during the 2 hours' treatment with alkali. While this does not exclude the possibility that the last traces of pectic substance are not removed in this time, the further possibilities that substances other than pectic, which are more electronegative than cellulose, may be removed from the fiber during the continued treatment with alkali, or that the surface of the fiber may be otherwise altered must not be overlooked.

All of the alkali-treated samples bound 0.010 milliequivalents of Ag^{+} or Ca^{++}. The results confirm our previously reported values for the equivalent weight of cotton cellulose, and further indicate that the divalent cations have both valences engaged by the fiber.

Methods for the Analysis of Cellulose Derivatives. Determination of Total Combined Acyl in Cellulose Organic Esters

Leo B. Genung and Russell C. Mallatt, Eastman Kodak Company, Rochester, N. Y.

Most of the published methods for the determination of combined acyl in cellulose derivatives have been restricted to acetyl in cellulose acetate. The three best methods, Eberstadt, alcohol alkali, and Ost acid distillation, have been further investigated as to their applicability for general acyl analysis. The effects of their more important variables have been measured, and the precision, accuracy, and range of applicability of each are reported.

In order to avoid errors due to the heterogeneity of the reaction mixture and to excess alkalinity or acidity, temperature, and time, these variables must be controlled within definite limits. It was found that saponifications by the Eberstadt method are best run at an initial alkali concentration of quarter normal for 48 hours at not higher than 35° C. This is the most accurate method, but is applicable to cellulose acetate and only certain other esters. Saponification methods using alcoholic alkali are applicable to practically all cellulose esters, but are less accurate and reliable. The most satisfactory conditions are quarter-normal initial concentration for 24 hours at not higher than 30° C. The acid distillation method of Ost is restricted in its application, but it has special uses due to shorter elapsed time required for an analysis and to the fact that only volatile acidity is measured.

Nitration of Woody Tissues

Edwin C. Jahn and Sydney Coppick

Natural unextracted ground woody tissues of ten different species, two ground wood pulps, and three partially delignified pulps have been nitrated under suitable conditions with appropriate mixtures of nitric and sulfuric acids. Yellow or orange products, otherwise similar in physical appearance to the original material, are formed. The products, if thoroughly washed with water, are stable.

The yield depends upon the nitrating conditions and materials used, but under the same conditions the hardwoods and straws give lower yields than the softwoods. For example, average yields for a given set of conditions were 112 and 122 per cent, respectively. Nitration of tissues which have been partially delignified results in higher yields. The ester nitrogen content of the nitrated natural woody tissues is about 11 per cent.

The nitrated tissues are about 20 to 30 per cent soluble in hot water and about 93 per cent soluble in acetone. There is a correlation between the hot water solubility and the content of readily oxidizable material in the nitrated product. By fractional precipitation from acetone solution it is possible to divide the nitrated wood into several rather clearly defined fractions.

The Influence of Alkali Upon the Physical Properties of Films Prepared from Cellulose Xanthate Solutions

E. Heuser and H. Y. Charbonnier

In connection with studies on cellulose xanthate the observation was made that a film cast from an aqueous solution of xanthate and thereafter set as usual in an acid-salt bath had lost much of its physical strength properties, much in contrast to a film prepared from ordinary viscose. In order to investigate this observation further, films were prepared from ordinary viscose and from aqueous solutions of the purified xanthate, the latter containing various amounts of alkali. The results of this investigation seem to indicate that the presence in the xanthate solution of a certain amount of alkali is essential in producing a film of sufficient physical strength and that the function of the alkali consists of decreasing the particle size of the dispersion so that a layer of such density is produced that it may sustain a considerable measure of physical stress.

Permeability of Regenerated Cellulose Film to Carbon Dioxide

Edward Mack, Jr., Sherman E. Smith, and W. Wycliffe Owen

An apparatus for measuring the rate at which gas diffused through film under controlled moisture conditions is described.

With this apparatus, the permeability to carbon dioxide of regenerated cellulose films produced by the viscose process was determined with the films containing various amounts of moisture. Permeabilities were determined using films containing internal strains introduced by drying under tension and those relieved of such strains.

The sorption isotherm and changes in length of the film due to moisture sorption were also determined.

Evidence of a change in the internal structure of the strained film is presented.

The behavior of the films as exhibited by permeability, sorption, and deformation data at various moisture contents, indicates that moisture is first sorbed on cellulose hydroxyl groups, then condenses in interstices in the micellar network, and finally at relative vapor pressures above 0.9, enters the amorphous regions in the cellulose structure.

The Use of Resins and Plastics for the Modification of Textile Fabrics

D. H. Powers, Röhm and Haas Company, Philadelphia, Pa.

In recent years much work has been done in developing synthetic fibers to replace animal or vegetable fibers. At the same time great progress has been made in finding synthetic materials for use in modifying and altering natural, as well as synthetic fibers. Outstanding in this latter type of development are the new synthetic resins for use in fabric finishing. New markets for cotton and rayon fabrics have been opened up through modifying cellulose fibers and fabrics with synthetic resins.

While the use of synthetic resins in textile finishing has been increasing rapidity for the last few years, added impetus has been given to the development with the advent of the war. Because of a shortage of silk and the rising price of woolens and worsteds, there has been greater need for materials which will impart the properties of silk and wool to cotton and rayon fabrics. Clear, colorless, synthetic resins provide the answer. When applied to cotton and rayon they give the resilience of wool and the durability of silk at a much lower cost.

A great many cotton and rayon fabrics now on the market have achieved popularity because they have been modified with synthetic resins. Numerous fabrics containing from 20 to 25 per cent synthetic resin are now available, and an increasing number are being introduced. It is interesting to note that although the housewife will select a resin treated fabric in preference to an untreated fabric, in most cases she does not even realize that the application of plastics makes the superior fabric possible. These modified materials retain all of the appearance, feel, and even microscopic characteristics of a fabric made exclusively of animal or vegetable fibers. On the other hand, the addition of the clear synthetic resin has given the fabric more resilience, durability and resistance to abrasion.

For some fabrics made from cotton or rayon, the incorporation of 3 to 5 per cent of a synthetic resin will increase the wear resistance from two to four fold. The incorporation of 10 to 15 per cent of a synthetic resin will produce a soft dress fabric or velvet with resilience equivalent to fabrics produced from wool or silk.

In textile finishing resins are applied as water dispersions or water solutions to obtain surface effects or to get penetration to the core of the fiber. Some synthetic resins can be applied in concentrations up to 30 or 35 per cent of the fabric content without any surface coating effects, without loss of fiber absorbency or fabric resilience, and without stiffening or harshening of the fiber. While synthetic finishing resins have been of principal interest and value for textiles used in the garment and upholstery fields, we may reasonably expect that the next decade will see a rapid growth of their use and application in the field of industrial fabrics.

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• CALENDAR • OF COMING EVENTS

Meeting, New York Section, Swiss Chalet, Rochelle Park, N. J., October 4, 1940.

Annual Meeting and Convention, auspices New York Section, October 18th and 19th, 1940, Hotel Commodore, New York City.

Meeting, Piedmont Section, Carolina Hotel, Pinehurst, N. C., November 1 and 2, 1940.

NOTICE

The Complete Program for the Twentieth Annual Meeting and Convention

Appears on Page P498

Textile Starches*

WILLARD L. MORGAN**

STARCHES in their various forms and modifications are undoubtedly one of the most widely used textile aids, entering as they do into yarn sizing and cloth finishing, and as a carrier in textile printing pastes.

The use of starch as a stiffener or as an adhesive, and as a finish, apparently began in the paper trade very early in antiquity. Its application to textiles apparently first began during the middle ages as a means of stiffening the clothing, and particularly the ruffles of the nobles and dignitaries in France and Holland. The latter country was one of the first producers of starch, and it seems that Queen Elizabeth in England, around 1560, went to considerable trouble to smuggle out a Flemish woman who thereafter was made a court functionary charged with keeping the royal clothing starched or stiff after each launder. The latter set up quite a business giving instructions at a fancy price, both on how to starch clothing, and how to make starch in the household from wheat flour. The use of starch in this way and as a powder in the hair soon became so largely taken up that by 1600, and again in 1800, the English parliament set up laws against the manufacture of starch. This was aimed at putting a little more of the starch on the inside of the body as food and less on the outside as adornment.

It was quite natural, therefore, that the textile industry should early start using starch, and by 1744 the English in their hand weaving were using starch as a means of sizing and of warp glazing, and had come to consider this as being absolutely necessary.

In these early times wheat starch crudely separated from flour was the starch used, although potato starch was soon taken up once the English textile trade began making demands. The modern day use of starch may really be said to have begun with Kirchhoff in 1811. This early chemist developed glucose in attempting to relieve the sugar shortage brought on by the Napoleonic Wars. He was also the first to study the thinning of starches by enzymes whereby the textile men were able to apply higher solids to their yarns and cloths. The activity started by these discoveries led to the first production of corn starch in this country by Kingsford in 1842, and following the introduction of the methods now used in the starch industry, corn starch became the leading textile starch at around 1885. Today, of course, we have entering into the textile trade not only the raw corn, potato and wheat, but tapioca and sago also, and we encounter a very large number of these products in modified forms giving varying degrees of thickness, stiffness, penetration, clarity and strength of film.

Likewise, the starches being used in textile printing are today very complicated in that several types of starches may be present and these may have been processed in several different ways. While starch was probably used as a thickener in the earliest hand block calico printing which began in this country around 1790, the use of roasted starches or dextrins did not begin until about 1821 in England. The preparation of dextrins or roasted starches and a comparison of these with the natural gums was evidently first made in 1804 by Bouillon LaGrange. Apparently, however, a fire in a textile mill at Dublin, Ireland, in 1821 was the actual event which led to the introduction of these types of starches into textiles. Some of the starches were accidentally roasted in the fire and were noticed as being much more easily soluble, and were found to give interesting results on the cloth. Soon the starch was roasted deliberately and used on the textiles widely in England. In this country, however, manufacture of such products was delayed until about 1870 when scarcity of natural gums particularly brought about much wider use of the British gums in printing.

In the past century from a use of 1,640,000 lbs. in 1831 the starch used by the American textile industries has increased to approximately 200,000,000 lbs. This starch use today amounts to approximately 1.5 lb. of starch for every 100 yards of goods, or an increase of 2.5 times the amount used in 1831. Between 5 and 10 per cent of the starch is used in printing. Of the total quantity of starches used, about 65 per cent originates from corn, 20 per cent being tapioca and sago, and the other 15 per cent largely potato, with a small amount of wheat.

As has often already been indicated, troubles such as uneven finishes or sticking in of starches in the engravings for printing may be avoided and the securing of maximum thickening value can be secured only by the complete pasting of starches. Due to the thick nature of these pastes, it has been difficult in the past to determine when complete pasting has been secured. Examination of diluted paste under the microscope with polarized light will show, if complete pasting has been secured, an absence of any grains

*Presented at meeting of R. I. Section, March, 1940.
**Research Director, Arnold, Hoffman & Co., Inc.

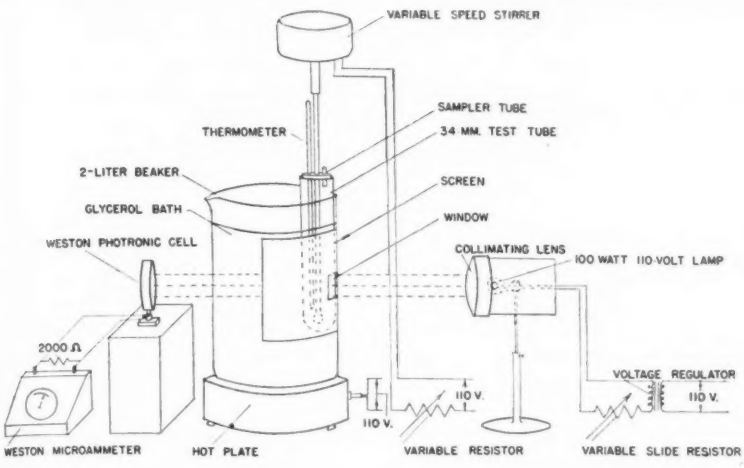


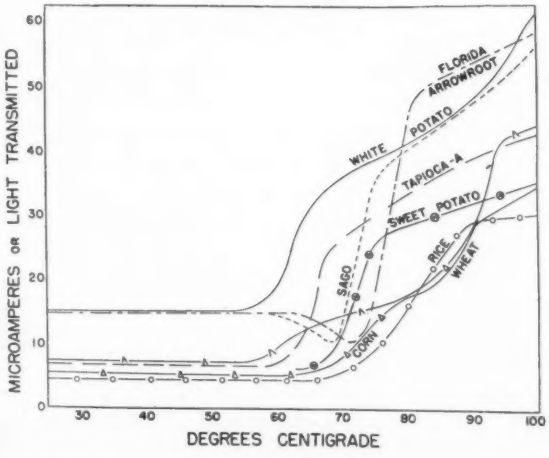
Figure 1—Photopasting Apparatus

giving the polarization crosses which are characteristic with most unpasted starch grains. This method is tedious and attempts to follow the degree of pasting by viscosity measurements have also been resorted to in the past.

When starches are heated in water, the suspensions gradually become translucent as pasting occurs. The author has found this effect can be made useful in studying the cooking characteristics of starches[1]. By means of apparatus which gradually raises the temperature of a 0.5 per cent starch suspension at the rate of 2.5° C. per minute, the change in transparency is followed with a photoelectric cell and microammeter, as shown in Figure 1.

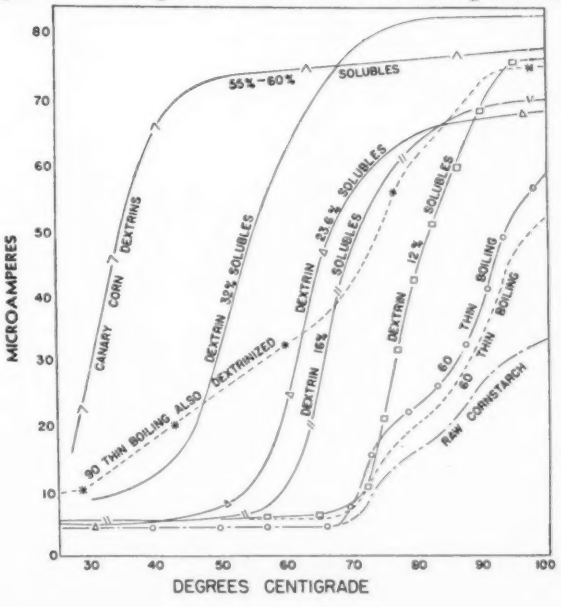
As can be seen in Figure 2, plotting the values of the temperature of the paste against the transparency gives curves which are characteristically different for the various raw starches. The initial pasting temperatures, as shown by the point at which the curve rises, correspond to the first appearances of pasting as shown by decrease in number of granules showing polarization under the microscope.

Figure 2—Pasting of Raw Starches. Pasting begins at: white potato, 55°; wheat, 56°; tapioca A, 61°; rice, 63-70°; corn, 64°; sweet potato, 64-67°; sago, 69.5-70°; Florida arrowroot, 72° C.



The initial suspensions of the larger grained starches at the low dilution of 0.5 per cent are less opaque than the smaller grained cereal starches (Figure 2). The breaking apart of small granules of sago and arrowroot into the individual grains gives a preliminary increase in opacity just prior to the beginning of pasting. This is characteristic of these and other sticky types of starches. The tuber type of starch shows steeper pasting curves than the grain starches—that is, they become pasted over a shorter temperature range. The curves clearly show the greater transparency characteristic of the pastes of tapioca, potato, and other tuber starches. The need for high-temperature cooking for complete pasting in making paper or textile sizes or pastes is apparent in these curves. Too low cooking temperature in the industrial pasting of starches is the source of considerable trouble.

Figure 3——Pasting of corn dextrins and thin-boiling starches.



In Figure 3 the form of the raw starch curve is still found in the acid thin-boiling starch curves, samples of two manufacturers being shown. The initial pasting temperature and the general location of the curve have, however, shifted upwards. Dextrinization has a greater effect, the curves showing decided shifts to lower initial pasting temperatures and greater final clarities, and the shifts being progressive with the increasing degree of dextrinization as shown by the figures for solubles. The 90 thin-boiling starch which had also been dextrinized shows an interesting curve indicating both types of treatments.

Similar shifts in the curves are found as tapioca is progressively dextrinized to higher degrees (Figure 4). Modi-

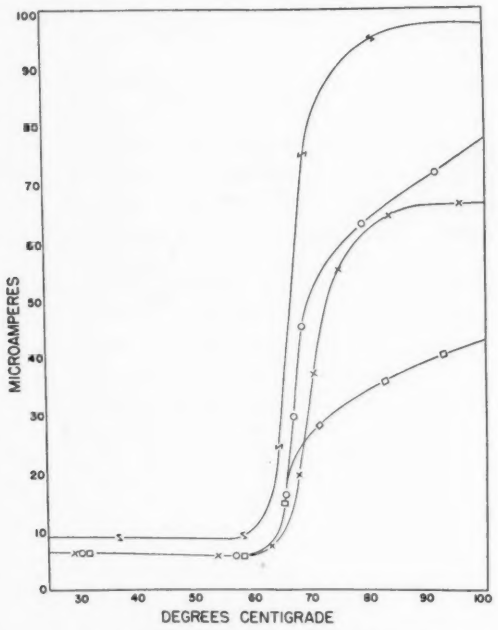


Figure 4—Pasting of Tapioca Dextrins

fication of starch by other treatments likewise gives curves with progressive shifting locations as increasing degree of modification shifts the starch to earlier pasting and greater paste clarity. It is apparent that such modification leads to easier pasting and to completion of pasting at relatively low temperatures offering advantages for some types of commercial applications.

In starch cookers with heated walls very good agitation is necessary and the walls must be continuously scraped if the heat is to be gotten into the batch. The time of cooking in any cooker is largely determined by the efficiency of the agitation. The more active the agitation and the thinner the film of paste left on the cooker walls, the easier the heat is forced into the paste and its temperature raised to the necessary temperatures as shown by the pasting curves. In order that the batch may actually get up the proper temperatures, the steam chambers must be relatively free of condensate. This is a frequent cause of trouble. In cooking with live steam entered directly into the batch, it should be under sufficient pressure and distribution to get thorough agitation.

While the use of modified starches leads to easier cooking, better penetration, and possible use of higher solids, or higher weightings, the actual choice of a starch for any given particular textile operation must be based on a large number of factors which only considerable experience can properly evaluate. Thus printing pastes call for definite thickness or consistency values, high color yields, wash-out values, print sharpness, as well as other factors. Finishing work again calls for certain viscosities for definite pick-up at various solids in order to secure the weight or hand desired. In addition to viscosity data, actual determination of the stiffness of a treated cloth on such a machine as the Shiefer flexometer is often desirable. Cotton and rayon sizing call for still other factors to be balanced. Because of the many factors which have to be considered, and the fact that the requirements for the numerous textile operations vary, there has been developed, and there is available today, an extremely wide variety of basic starches or starch compositions available to and used in the various textile processes.

REFERENCE

[1]W. L. Morgan, Journal of Ind. & Eng. Chem., Anal. Ed., Vol. 12, P313-17, 1940.

OUTING, NORTHERN NEW ENGLAND SECTION

THE eighteenth annual outing of the Northern New England Section was held on Friday, June 7, 1940, at the Vesper Country Club, Lowell, Massachusetts.

C. H. A. Schmitt was Chairman of the Outing Committee, and under his direction this Section enjoyed one of its best outings. About one hundred and fifty members and guests were present for the dinner which followed a well-rounded sports program. The Section is much indebted to the many dyestuff and chemical concerns for their cooperation in making it possible to distribute many prizes for the various sporting events and also for those drawn by number at the dinner.

Respectfully submitted,

J. N. DALTON, *Secretary.*

NOTE: *A number of photos taken by Dr. H. C. Chapin at the outing appeared in the last issue of the* REPORTER.—ED.

An Invitation to Attend the Twentieth Annual Meeting and Convention —

P. J. KENNEDY
General Chairman

Dear Member:

The officers and members of the New York Section extend to you and your friends a very cordial invitation to attend the 20th annual national convention of our association.

The convention committees have been working hard for many months to make your visit to New York City a memorable one, not overlooking the many educational and entertainment features of this great city.

The technical program has been carefully planned and I am sure each of the fine papers will present information of interest on many new textile developments.

A special award has been offered for the best technical paper submitted in the Inter-Sectional Contest on Friday afternoon, October 18th. This award will be presented with appropriate ceremony at a luncheon at the New York World's Fair on Sunday, October 20th, which has been designated "Special Day" for the A.A.T.C.C. I am happy to report that this contest has created considerable interest.

The Ladies' Committee has planned many unusual features which include visits to large broadcasting studios, consumer laboratories, etc.

I want to take this opportunity to express my deep appreciation for the fine work of the convention committees, as well as all others who assisted directly or indirectly, in offering a most ambitious program.

In closing, permit me to say that these activities have been planned for your benefit and your attendance will be our reward for making this convention a success.

It will be a pleasure to have you and your family with us.

Our convention committees will do all they can to make your visit a happy occasion.

Sincerely yours,
PATRICK J. KENNEDY,
General Chairman,
1940 A.A.T.C.C. CONVENTION

Program

Annual Meeting and Convention

October 18 and 19, Hotel Commodore; October 20, New York World's Fair

Auspices of New York Section

Friday, October 18, 1940

A.M.

9:00—Registration Opens in Grand Ballroom Foyer.

9:30—One hundred and twenty-ninth Council Meeting—Room C.

10:30—One hundred and twenty-second Meeting of Research Committee—Room B.

P.M.

12:15—Luncheon for Council and Research Committee—Room A.

2:00—Official Opening of the Convention and Technical Session—East Ballroom.
Introductory remarks by:
Henry F. Herrmann, Vice-Chairman, Convention Committee.
Louis A. Olney, Chairman, Research Committee.
Walter M. Scott, Chairman, Technical Program Committee.

Inter-Sectional Contest

P.M.

2:15—"Development of Hosiery Processing in the South"—South Central Section.

2:30—"Informative Textile Labeling"—New York Section.

2:50—"An Analysis of the Split-Bath Method of Dyeing Silk Hosiery"—Midwest Section.

3:10—"Screen Printing in the South"—Piedmont Section.

3:40—"Some Observations on the Tendering of Vat and Naphthol Dyed Army Duck on Total Exposure to Weathering"—Southeastern Section.

4:00—"Variables Encountered in Fade-Ometer Testing"—Philadelphia Section.

4:20—"The Effect of Modern Finishing Agents on the Light Fastness of Cotton Colors"—Rhode Island Section.

4:40—"What Is New in New England"—Northern New England Section.

5:00—General Discussion of Sectional Papers.

5:30—ANNUAL BUSINESS MEETING.

7:00—Dinner and Entertainment—East Ballroom.
Official Welcome.
Speakers:
Carl Z. Draves, President of the Association.
J. E. Meili, Chairman of the New York Section.
His Honor, F. H. LaGuardia, Mayor of the City of New York.

10:00—RECESS.

Saturday, October 19, 1940

Symposium on Evaluation of the Properties of Finished Textiles—Rooms B and C.

A.M.

9:30—"Wear and Porosity"—By Erwin J. Saxl of the Saxl Instrument Company, Inc.

10:00—"The Use of the Black Carpet Beetle in the Testing of Mothproofed Materials"—By Ruth E. Slabaugh of the Department of Entomology, University of Missouri.

10:30—"A Simple Apparatus for Testing Fireproofed Fabrics"—By Emily W. Akin and Alfred R. Macormac of the Graduate School, Alabama Polytechnic Institute.

11:00—"A Report of the Committee on Crease-Resistance and Permanency of Finish"—By Kenneth H. Barnard of the Pacific Mills Print Works.

11:30—"The Evolution of Water-Resisting Textile Finishes"—By George A. Slowinske of E. I. du Pont de Nemours & Company.

Symposium on Chemical and Dyeing Aids for the Textile Industry—East Ballroom.

A.M.

9:30—"Shrink-Proofing of Wool with Bromine"—By Ralph L. Ericsson of the Warner Chemical Company.

10:00—"Some Use of Tetra Sodium Pyro Phosphate in the Textile Industry"—By Paul Logue of the Monsanto Chemical Co.

10:30—"The Dyeing of Nylon with Acid Colors"—By P. H. Stott of E. I. du Pont de Nemours & Company.

11:00—"Surface Active Agents in the Degumming of Silk Hosiery"—By O. M. Morgan and H. Seyferth of the National Aniline & Chemical Company.

11:30—"Microscopic Observations of Wool Dyeing—Part II"—By G. L. Royer and H. E. Millson of the Calco Chemical Division, American Cyanamid Company.

P.M.

12:15—Invitation Luncheon for National and Sectional Officers—Room A.

Saturday afternoon has been reserved for sightseeing, attendance at sporting events or other activities as the members desire.

7:00—BANQUET—Grand Ballroom (Dress Optional).
Toastmaster: Elvin H. Killheffer.
Speakers: To be announced.

Sunday, October 20, 1940

Special A.A.T.C.C. Day, New York World's Fair—Flushing, N. Y.

P.M.

2:00—Luncheon—National Advisory Committees' Building—Amusement Area at the New York World's Fair.
Presiding: Louis A. Olney, President Emeritus and Chairman of the Research Committee.
Presentation of: Special Award for the Winning Contest Technical Paper.

Convention News

MAYOR LaGUARDIA TO SPEAK

THE honored guest speaker at the informal dinner on Friday evening will be F. H. LaGuardia, mayor of the city of New York.

Mayor LaGuardia needs no introduction to the members as he has been a national figure for many years, lately

coming into further prominence as chairman for the United States Government on the Permanent Joint Board on Defense of the United States and Canada. He is president of of the United States Conference of Mayors and previously has been a Congressman from New York, president of the New York City Board of Aldermen and a member of the U. S. diplomatic service. He was an aviator during the last war and retired with the rank of major.

Mayor LaGuardia is an effective public speaker and is sure to deliver an excellent address.

FOR THE LADIES

PLANS are well formulated for the amusement and entertainment of the ladies who come to the convention.

On **Friday morning** it is important that every lady register in the South Room of the Commodore lobby. This room will be "Ladies' Headquarters," and here you will get information about places to go, shops, sightseeing, etc.

Miss Bernice Bronner, chairman of the Ladies' Committee, has planned, among other things, a trip to Macy's store, where you will be taken in a "Behind the Scenes Tour" and also will see Macy's famous Bureau of Standards. You can also be present at the Macy Consumer Quiz Broadcast.

Friday afternoon you are invited to have tea at Good Housekeeping Institute. Late Friday evening you can attend Fred Waring's broadcast.

Saturday morning Elizabeth Arden is putting on a special show at her shop. **Saturday night** there is another broadcast, this one at Radio City.

Sunday there is a luncheon you shouldn't miss, at the National Advisory Committees' beautiful building at the New York World's Fair.

These are just some of the highlights. We are going to have a good time, and are looking forward to seeing you.

TRANSPORTATION

MEMBERS of the Transportation Committee will be available during the annual meeting to advise as to the best and most economical methods of travel. They will be glad to help visitors plan sight-seeing trips.

Effective September 1, 1940, for parties of fifteen or more traveling together on the same train on one ticket on the going trip and on separate individual tickets for the return trip (see exception below*), there is applicable for one-way distances up to 500 miles between points in the territories of the Central Passenger and Trunk Line Associations a general basis per capita of the one-way first-class lower berth rail fare for the round trip, which is one and one-half cents per mile in each direction, with slight variations between certain points where there are different fares via some lines than over others. For one-way distances beyond 500 miles round trip coach party fares are on the basis of 1.35 cents per mile in each direction. Coach party tickets are good for travel only in coaches and will not be made valid for travel in sleeping or parlor cars by additional payment. The return limit is twenty days in addition to date of sale.

***Exception:** There are a few points in the eastern seaboard territory where the entire party is required to travel on one ticket in **both** directions.

Members who desire further, specific information may obtain same by contacting Lloyd H. Winnell, Chairman of the Transportation Committee, National Aniline & Chemical Co., 40 Rector Street, New York City.

SPORTS AND SPORTING EVENTS

THE Sports Committee will be glad to assist members who wish to play golf, by obtaining guest privileges for them at various metropolitan courses. They are also in a position to obtain tickets for various sporting events as desired. Why not enjoy a game of golf Sunday forenoon, attend the luncheon at the New York World's Fair at two o'clock and spend the remainder of the day visiting the attractions at the Fair?

Communications in regard to sports should be sent to Max Kaesche, Chairman of the Sports Committee, Sandoz Chemical Works, Inc., 61 Van Dam Street, New York, N. Y.

EXHIBITS

ELABORATE displays are planned by several important textile houses in the metropolitan area. Considerable enthusiasm has been expressed concerning the idea and it promises to be a feature attraction.

RADIO BROADCAST

ON the Macy Consumer Quiz Club Hour, broadcast over Station WOR on Wednesday, October 2nd, at 12:45 P. M., H. F. Herrmann, vice-chairman of the 1940 convention committee, will be interviewed by Fred Utell on the contribution of our association in regard to relations between the textile industry and the consumer.

Concerning Tickets *for the* 20th Annual Banquet

The banquet at the Hotel Commodore on Saturday evening, October 19th, will be the principal feature of the 20th Annual Meeting of the American Association of Textile Chemists and Colorists.

The Committee has spared no effort to insure its success — gifted speakers—unusual entertainment—superior food—all are assured. Dr. Elvin H. Killheffer will act as toastmaster. It is confidently expected that this will prove to be the largest gathering of textile-chemical men ever to assemble in America.

Because of the necessity of making preparations well in advance, the Committee requests that banquet tickets be purchased before the actual date of the meeting. Groups of ten wishing to sit together may reserve tables. To eliminate bookkeeping, tickets will be sold only on a cash basis.

So please fill out at once the coupon below and return to the undersigned with your check, to the end that your seat at the banquet may be assured.

A. P. HOWES
Treasurer of Committee.

A. P. Howes, 440 Fourth Ave., New York City

Enclosed is check for $—— to cover —— tickets for the 20th annual Banquet of the A.A.T.C.C. Please hold tickets at registration desk or mail to address below (indicate which)

Name .....

Address .....

Tickets $5.00 each

Checks to order of A. P. Howes, Treasurer .....

• TECHNICAL NOTES • FROM FOREIGN SOURCES

The Differentiation Between Lanital, Wool and Casein

Justin-Mueller—R. G. Mat. Col., 518-109, *March*, 1940.—Though Lanital, a fiber made from milk casein, and wool, a natural fiber, are certainly both of animal origin, physiologically there exists between them an appreciable difference. From the standpoint of morphology also it may be considered that a native fiber cannot be compared with one spun mechanically from a viscose solution and artificially coagulated. It is, however, their chemical characteristics which at present concern the author.

To secure as complete a survey as possible, the two fibers were subjected to certain chemical tests along with casein and egg albumen. The first step consisted in treating the four substances separately at varying temperatures with caustic soda solution of 5.58 per cent concentration (8.5° Be.) and observing the disintegration undergone by each. The results are recorded in a table (No. 1), and show a marked difference between Lanital and the other materials. Even at high temperatures the Lanital decomposed only in part, the others having completely disintegrated at temperatures between 80° and 95° C. Attention is called to the superior resistance of Lanital, thus shown, to that of casein, its parent substance. The "degree of disintegration" determined, as recorded in the same table, shows the decomposition of Lanital to be only one-half that suffered by wool.

A determination of the sulfur content of each material, made after the caustic treatment, indicated that of wool and of albumen to be approximately the same; casein showed the presence of a small amount of sulfur, and Lanital none whatever. This clearly defined presence of sulfur in wool, and its complete absence in Lanital, constitute a fundamental chemical difference between the two fibers. The sulfur determinations, made by the sodium nitroprussiate method, are also given in Table No. 1, in relative amounts which may be represented by the scale: Lanital—0; casein—1; egg albumen—3; wool—4.

As the original casein contains some amount of sulfur, while Lanital contains none, it appears that the sulfur of casein must have been eliminated in the Lanital manufacturing process, presumably by the treatment with dilute sulfuric acid which the fiber undergoes in the coagulating bath. As a check on this assumption, the author carried out a series of trials in which Lanital, wool and casein were subjected to the action of concentrated sulfuric acid, with observed results which are presented in Table No. 2. Here again, as in the case of caustic treatment, Lanital was found to be the most completely resistant of the substances tested, and though sulfur in the form of sulfurous acid was liberated from both wool and casein (according to the equation $S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$), there was no such liberation noted in the case of Lanital.

It was observed that on treatment with the concentrated acid the wool remained in fiber form until the moment of complete disintegration, but the Lanital persisted as a viscous or gelatinous mass after both wool and casein had been destroyed.

It is concluded that Lanital chiefly differs from wool and from proteins in general by its complete freedom from sulfur and by its greater resistance to various chemical agents.

The Identification of Vat Dyes on Linen and Cotton Materials

Bradley and Derrett-Smith—J. Soc. Dyers & Col., 56-97, *March*, 1940. This paper presents a carefully worked-out scheme for identification on the fiber (cotton and linen) of all available British, German and Swiss vat dyes. Four simple chemical tests are used for each dye, and tables of the characteristic reactions so arranged that any dye under examination may be readily found in them when its behavior in the four tests has been observed.

In cases of similar commercial products, sold under different trade names but giving identical reactions under these tests, such dyes have been classed as "synonymous" and grouped under the name of the British-made dye, where possible.

The method of identification is limited to dyeings of individual vat dyes. The usual difficulty is encountered with shades which are mixtures of two or more dyes, though if one component of such a mixture is present in large excess it may frequently be identified.

In view of the amount of work previously done in the field of vat dye identification the authors suggest as justification of these tables the following points: the range of vat dyes examined has been made as complete and up-to-date as possible, with obsolete dyes omitted; dyes are not arranged according to manufacturers' names, but those with the same characteristics are grouped together, while those with only slight differences are placed adjacent to each other; the four reagents employed are believed necessary and sufficient to the identification of all vat dyes, excepting only a few blue and black dyes, for which additional tests are indicated; the terminology used in describing the characteristics of dyes has been curtailed and clarified, referring in every case only to the colors observed.

The four reagents specified are alkaline hydrosulfite, acid hydrosulfite, concentrated nitric and concentrated sulfuric acid. Full instructions are given as to their preparations and use. It is pointed out that the "vat" obtained in alkaline solution of hydrosulfite is the alkaline salt of the leuco-compound, while in acid hydrosulfite is given the color of the free leuco-compound, which is in many cases different from that of the alkaline "vat" or of the original dyed shades.

A total of 813 dyeings of individual vat dyes has been examined, and the dyes classified in seven separate tables according to their nominal color—Yellow and Orange, Red, Violet, Blue, Green, Brown, Grey and Black. "Synonymous" dyes are grouped together, and the characteristic color reactions for each group given in parallel columns.

Appendix 1 describes tests used in distinguishing between the various types of dyes—direct, developed, sulfur, etc.—commonly found on linen and cotton materials, and a second appendix is devoted to the identification of Indanthrone Blues, which are closely related to the Indigo dyes. An index gives list number and table location for each of the many dyes examined.

The communication represents an impressive amount of careful work, and should prove a valuable addition to the literature dealing with vat dye identification.

The Dyeing of Cellulosic Materials: A Review of the Physics and Chemistry of the Dyeing Process

Boulton and Morton—J. Soc. Dyers & Col., 56-145. *April,* 1940.—In this communication from the Textile Research Laboratory of Courtaulds, Ltd., a paper originally prepared for presentation at the Symposium on the Chemistry of Cellulose, the authors review in a critical sense the mass of information which has been collected in the last few years concerning the fundamental processes of the absorption of substantive dyes by cellulose. Our thanks are due them for an extremely competent and interesting presentation of this important subject.

"Substantive dye" is used by the authors as a generic term to include the direct cotton dyes, Indigosols, leuco vats, sulfurs and such dye components as the "naphthols," which are positively absorbed by cellulose.

The greatest advance of the last decade toward the solution of the dyeing problem has been achieved with viscose yarn and sheet as the working material, and not with the cotton to which earlier workers devoted so much attention. The present discussion of the dyeing theory therefore refers specifically to viscose cellulose unless otherwise indicated. The detailed behavior of cotton hairs and viscose filaments are notably different. It may also be stated that very little is as yet known with certainty about the kinetics of dye absorption by cotton and the other natural cellulose fibers.

In order to obtain a clear view of the process of dyeing it is necessary to understand the structure of the fiber, the mode of fixation of the dye to the fiber, the structure of the dye solution, the manner of the transference of the dye to the interior of the fiber and the dynamic interaction of these factors.

The fine structure of cellulose is of primary importance to the theory of dyeing, since the system of capillary canals forms the path by which the dye molecules or particles migrate and distribute themselves throughout the fiber. Like all other textile materials, cellulose is composed of long chain-like molecules. Its molecular construction was first established by Haworth in 1928 as a chain polymer of beta-1:4-anhydroglucopyranose. The balance of evidence favors the hypothesis of Staudinger that its chain length may range up to 2,000 glucose units and more. Satisfactory textile properties are possessed by materials whose molecules probably contain an average of at least 500 glucose units. The length of such molecular chains is about 250 A.U.

The chemical unit of cellulose is thus a very long chain of glucose residues linked together by glucosidic oxygen bridges. There are regions of crystallinity—crystallites or micelles—in cellulose fibers. There is general agreement that these crystallites contain cellulose chain molecules lying side by side in crystalline order. The size of crystallites in ramie is computed to be about 600 A.U. along the length of the molecules and about 60 A.U. in a perpendicular direction; those of viscose cellulose are rather smaller. It is the current view that a single chain molecule may be a component of several crystallites separated by more or less amorphous regions.

The size of the pores in the intercrystalline regions is of great importance in the theory of dyeing. When swollen with water, their molecular chains are moved apart by osmotic pressure and from an open network through which small molecules may pass with ease. In dry unswollen viscose sheet ("Cellophane") the capillary canals are less than about 5 A.U.; in the water swollen condition the average diameter of these same canals is about 20 A.U. These values may be compared with the average dimensions of a direct cotton dye molecule, about 30x8x3 A.U.

In dyeing cellulose from the normal aqueous dye bath the material is in a fully swollen state, and penetration of the dye to the interior of the fiber must be considered as migration of the dye molecules along the paths provided by the fully extended capillary canals. The extent of swelling is obviously one of the factors controlling absorption of the dye. The crystallites are too closely packed to be penetrated by dye molecules, which must, therefore, be absorbed on the more or less individual molecular chains in the amorphous or non-crystalline regions.

It is probable that there is a specific fraction of non-crystalline cellulose available for the fixation of dye molecules characteristic for each variety of cellulose. Thus, while the dyeing speeds of viscose may vary widely, the equilibrium absorption of dye is the same, or very nearly the same, for all samples. On the other hand, the greater equilibrium absorptions of direct dyes on viscose cellulose

than on cotton is probably to be explained by the higher fraction of non-crystalline regions to be found in the former material.

The great increase of dyeing rate with increase of temperature cannot be assigned to a change in the cellulose fine structure. The mean diameter of the capillary pores of water swollen viscose sheet does not vary measurably between 20° C. and 80° C.

The physical properties of dissolved cotton dyes are so dependent upon traces of other substances, especially salts, that the greater part of the results of investigations on solutions of direct cotton dyes made before 1930, when the importance of employing pure dyes was first well understood, must be discounted. Several methods of purification have been used with varying degrees of success. The one most widely employed is repeated salting out of the dye from aqueous solution by sodium acetate until it contains no impurity other than this salt, which is then removed by extraction with boiling alcohol.

In general it appears that in aqueous solution cellulose dyes are not dispersed to single molecules or ions, but are aggregated to submicroscopic micelles containing a number of dye ions, the charge on these aggregates being matched by a corresponding number of free sodium ions ("Gegenions"). Though experimental results indicate the occurrence of such aggregations, no generally accepted quantitative estimation of the degree of association is forthcoming. The aggregation has been shown to increase with an increased salt content of the solution, and comparatively large aggregates to be present in aqueous dye solutions even at 75° C. It is probable that direct cotton dyes in aqueous solution are not dispersed to colloidal micelles of uniform size, but are poly-disperse.

Wide variations in aggregations exist between different dyes. The mean particle size increases with the salt content of the bath, and decreases with increasing temperature. In solutions of the composition normally used in dyeing at 80-100° C. it is probable that the average number of dye molecules is not of a much greater order than 10. The aggregation of the direct cotton dyes is probably best explained by the formation of coordinate bonds between the aggregating molecules, as, for example, hydrogen bonds between such polar groups as hydroxyl, amino, etc.

The diameter of the capillary pores in viscose cellulose is of the same order as the length of a typical direct cotton dye molecule. Since the pores are responsible for the transport of dye to the interior of the fiber, it is almost certain that the dyes are absorbed molecularly, and not as dye micelles. The majority of such dyes possess flat elongated molecular structures, and it is probable that they are dispersed in the absorbed state with their long axis parallel to the axis of the long cellulose chain molecule on which they are fixed. Since the union between dye and cellulose is comparatively readily dissociated by water, it is probable that the link is neither the ordinary co-valent bond of organic chemistry nor the salt bond which binds acid dye and protein fiber. It is more likely that the union is a co-ordinate bond (hydrogen bond) between the polar amino, hydroxyl, etc. groups of the dye molecule and the hydroxyl groups of the cellulose. This may be summarized in the statement that direct cotton dye and cellulose unite to form a molecular compound. In general, it is observed that an ionic substance is absorbed by cellulose from an aqueous solution only if, amongst other conditions, it behaves as a colloidal electrolyte.

Direct cotton dyes are absorbed by cellulose as a neutral molecule, i.e., equivalent proportions of sodium and dye ions are simultaneously absorbed. Absorption occurs at a speed which depends on the dye, the temperature and certain other factors, and proceeds at a decreasing rate until equilibrium is reached. In this state a certain amount of dye absorbed on the cellulose is in equilibrium with a definite concentration of dissolved dye. The equilibrium is a bulk and not a surface effect, the absorbed dye being distributed uniformly throughout the fiber. The equilibrium is truly reversible. The partition of dye between cellulose and solution is determined by the temperature, salt concentration and ratio of bath to fiber.

Dyeing is a diffusion process, and dye absorption follows, to a first approximation, the course expected of a process obeying the simplest diffusion law. Numerous deviations from Frick's Law of Diffusion have been noted, but they may usually be ignored in practice. In the case of natural cellulosic fibers, however, it has been tentatively concluded from various experimental data that, probably due to the non-uniform fine structure of these materials, the absorption of dye does not obey a simple diffusion law.

The varying effects of the absorption of a substantive dye by cellulose as described up to this point may be combined in a brief unified description of the process:

When a cellulose fiber is immersed in a solution of substantive dye containing a salt, dye is immediately absorbed by the cellulose chain molecules forming the surface of the filament. When this almost instantaneous absorption is complete, dye molecules proceed into the interior of the fiber along the paths provided by the capillary pores between the intercrystallite molecular chains of the swollen cellulose structure. The small dimensions of these pores permit only the migration of single molecules or perhaps aggregates of a few dye molecules. The dye solution, in which particles of all sizes from single molecules to large aggregates co-exist in dynamic equilibrium, is thus depleted of its single molecules. These are quickly reformed by the breakdown of the larger aggregates until equilibrium is restored.

Some of the diffusing dye molecules are absorbed by the cellulose molecules which make up the wall of the capillary, forming a co-ordinate molecular compound, and the rest pass on. The dye absorbed on the walls is understood to be in instantaneous equilibrium with the dye passing through the capillary. In this manner a continuous stream of dye molecules passes from the dye solution to the interior of the fiber until a final state is reached

where the whole mass of dyed cellulose is in equilibrium with the dye solution.

The poly-disperse equilibrium in a direct cotton dye solution is completely restored within a few minutes at 30° C. and within a few seconds or less at 90° C; periods of time which are much less than those required to reach equilibrium between dye solution and fiber. The rate of dye absorption is therefore controlled by the relatively slow rate of diffusion of the dye in cellulose, and not by the rate of formation of dye molecules from the large aggregates in the dye solution.

The dye is absorbed by the fiber in a manner very nearly represented by a simple diffusion process. The apparent diffusion constant does not, however, refer to the speed of migration of a single molecule in the capillary canals, but to this speed reduced by a factor determined by substantivity relationships.

A slowly diffusing dye differs from one which diffuses rapidly in that a solution of the former contains few, and of the latter many, single molecules.

This model of the absorption of a substantive dye may be termed the molecular theory of the dyeing of cellulose. It is quite possible that it is oversimplified, but it does present the most convenient hypothesis so far suggested for the co-ordination of a mass of dyeing information.

The authors close this exceptionally instructive paper with an enumeration of certain aspects of both cellulose and dye behavior which require more precise investigation for final clarification.

Physical and Colloido-Chemical Aspects of Mercerization

L. Bonnet—R. G. Mat. Col., 519-133, *April*, 1940.—The effects produced by mercerization of cotton are the result of physical and chemical modifications of the fiber induced by the action of caustic soda. Though conditions under which the optimum mercerizing effect is secured have been minutely studied, and the results obtained by such researches largely confirmed in actual practice, it is nevertheless true that the reaction undergone by the cellulose fiber in contact with sodium hydroxide solution is not fully understood. It is known that cold concentrated caustic lye modifies the exterior aspect of the fiber, and it may be assumed that such modifications are the result of important transformations in its finer structure. It is the swelling of cellulosic fibers from action of soda lye which determines the mercerizing process, and it follows that the mechanism of this swelling is of primary importance.

As in the case of protein fibers, the maximum swelling of cellulose may be explained by the action of intermolecular forces or by osmotic pressure. When treated with caustic the cotton reacts like a weak monobasic acid. It is first chemically neutralized, then the resulting salt dissociates into cations of sodium or potassium and large cellulosic anions. The cations, retained in the submicroscopic canals and intermicellar spaces of the fiber, oppose further penetration of alkali ions with a resistance which increases with concentration of the lye, as does the osmotic pressure of swelling. The process continues with increasing difference of ion concentration within and without the fiber up to the point where maximum fixation of alkali by the cellulose is attained, which is believed to correspond to one molecule of alkali hydrate for one molecule of cellulose. The lye which has penetrated into the canals of the fiber enlarges them by its contribution of water. As sodium ions are more strongly hydroxyl than potassium ions, soda lye produces a more marked swelling of cellulose fiber than does potash. The same mechanism of swelling applies to regenerated cellulose, or cellulose hydrate, though the maximum swelling occurs with this material at a somewhat lower concentration of alkali than in the case of cotton.

Lye which has penetrated into the capillary fissures and sub-microscopic canals of the fibers next enters the intermicellar spaces and by swelling there penetrates into the principal valence chains of the cellulose macro-molecule, with formation of alkali-cellulose. Contraction of the swollen fiber is due to the fact that its outer layers, first in contact with the mercerizing liquor, swell more rapidly and more strongly than the inner layers. The transversal force thus set up exerts a longitudinal strain on the fiber, resulting in shrinkage.

Concentrated lye does not penetrate the cotton fiber uniformly because of the presence on the fiber surface of water-repellent bodies, such as waxes, or fatty matter, and because of the high surface tension of concentrated alkaline hydroxide solution, opposed as it is by the capillary pressure of the fiber, which increases with the fineness of the sub-microscopic canals. This is why the fiber of cellulose hydrate swells more readily, its fine structure being more porous than that of native cotton.

As a result of the contraction of the fiber caused by the mercerizing liquor, the crystallites and principal valence chains assume a more regular arrangement. The parallelization of the crystallites in the direction of the longitudinal axis of the fiber brings nearer together the principal valence chains, or, to express it differently, increases the degree of orientation, so that many hydroxyl groups are led to assist internal cohesion by saturation of the residual valences, to which fact is due the increased fiber resistance of mercerized cotton.

In addition to colloido-chemical phenomena, mercerizing involves physical and chemical action as well. The liberation of heat which accompanies the process caused it originally to be considered exclusively a chemical reaction, which is true only in part. The production of alkali-cellulose is chemical, the ensuing swelling in excess alkali is colloido-chemical, and the lustering of the fiber, now become smooth and rounded, is the result of purely physical action.

In practice, mercerizing may be carried on either without or with tension. The first method, in which the fabric is pulled out to original dimensions after it has been mer-

cerized, requires somewhat less concentrated caustic and results in less luster of the fiber, though giving it greater dye affinity than does the more commonly used tension method. Cloth may be first boiled off and then mercerized wet, or it may be mercerized in the gray, with the addition of some penetrating agent to the mercerizing bath.

Many substances have been recommended as auxiliaries or assistants in mercerizing, their function being to aid penetration of the fiber by the caustic liquor. Agents of this type should possess certain qualities, such as the ability to dissolve completely and readily in the caustic without subsequent separation. They should retain indefinitely their penetrating properties, and should never cause frothing in the mercerizing bath. The most widely used compounds for this purpose have so far been generally found among the phenols or cresols rather than among the fatty acid or alcohol derivatives. Though the phenols are not especially good wetting agents as such, they possess the valuable property of dispersing or emulsifying the cotton impurities which would otherwise be insoluble in the mercerizing liquor. Of late a number of other compounds, many of them not of the phenol type, may be seen coming into use as mercerizing assistants.

Printing Pigment Colors with Resin Bases

E. A. Sack—R. G. Mat. Col., 519-113, *April*, 1940.—The materials which are generally described as plastics have of late years found application in many different industries. Among them the synthetic resins occupy an increasingly important place. One interesting problem to which this type of compound appears able to furnish a solution is that of fixing pigments on fabric.

The disadvantages inherent in the method of pigment fixation by use of albumen or casein have long been known. On the other hand, these colors possess certain advantages, such as cheapness, ease of application and their ability to print in fine designs, often impossible to obtain with other colors, which have assured their continued use by printers for certain styles of work. The method of fixing pigments by means of a varnish or coagulating compound is of very ancient origin, such prints having been found in the tombs of the Pharos.

Certain patents recently granted, in the United States to the Interchemical Corporation and in France to the Etablissements Kuhlmann, have served to indicate an entirely new orientation in pigment printing methods. The colors in these new processes are prepared by incorporating pigments, under specified conditions, into synthetic resins and then emulsifying the mixture in water. There is thus obtained a range of colors in paste form which upon addition of a fixing agent is ready to be printed. Such colors are known in the United States as Aridye, in France as Pigma.

They may be applied by regular printing methods to cotton or rayon (viscose or acetate) as well as to silk, wool or mixed fabrics. Their fixation is secured simply by action of heat and air, and after drying a wash in cold water is all that is necessary.

As the colors have no tendency to spread through capillarity they permit in printing the use of very fine engravings, such as those especially required for shirting styles. They are resistant to soaping, and their fastness to chlorine and to light is generally equal to that of the vat colors. They may be printed along with azoic and certain chrome colors, not being harmed by such steaming as the accompanying colors may require. The aqueous emulsions in which the resins are employed are easily removed from printing rollers and utensils, not requiring the use of solvents or special cleaning agents.

These new products have still to undergo the trial of prolonged practical use. If they prove successful, the synthetic resins will have demonstrated a new value in the textile field which will extend the already wide range of their application.

Progress in Bleaching and Dyeing of Textiles

Gordon-Abramow—R. G. Mat. Col., 519-125, *April*, 1940.—The author surveys briefly recent technical and patent literature, to note the more interesting and important developments there manifested in methods dealing with bleaching and dyeing textile materials.

In bleaching, numerous patents listed cover the use of hydrogen peroxide, usually at elevated temperatures, with the addition of various stabilizing substances to the bath. A few deal with the use of chlorine as a bleaching agent, notably in the use of chlorites instead of hypochlorites, and also with the joint use of chlorine and peroxide, either together or by successive treatments.

As might be expected, the tendency of new patents in the field of dyeing is to cover color processes applicable to fabrics composed of mixed fibers, natural or artificial, either of cellulose or of protein. Certain azo colors are claimed to be suitable for both types of fibers. Also various processes are based upon methods which to a greater or less degree produced changes in the nature of the fiber and thus influence its dyeing characteristics. Numerous fabric treatments auxiliary or supplementary to dyeing are discussed.

The next issue of American Dyestuff Reporter will be the annual Processing Review Number

• TESTIMONIAL DINNER TO W. A. TRAVER

On Saturday evening, Sept. 21st, the employees of Franklin Process Company of Providence, R. I., gave a testimonial dinner at the Providence-Biltmore Hotel for W. Allen Traver, Vice-President and General Plant Manager, who is this year completing 25 years of continuous service with the company. Nearly 700 employees and members of their immediate families were present.

Mr. Traver, to fittingly recognize the many other employees who have helped to make his succesful management possible, gave out approximately 130 service buttons to those who had been with the company 10 years or more.

Mr. Traver was born in Worcester, Massachusetts, February 15, 1886, was educated in the Worcester public schools and after graduation was employed by his uncle at the William Allen Boiler Works of Worcester. In the fall of 1915 he went with Franklin Process Company of Providence (makers of dyeing machines and custom yarn dyers) as mechanical superintendent. In 1918 he became Assistant Manager and a director of the company; in 1920 General Plant Manager and in 1933 Vice-President and General Plant Manager, which position he holds at the present time.

John M. Wood, Mechanical Superintendent of the company, presided as toastmaster. The speakers were E. S. Graves, President and General Manager, L. W. Jones, Treasurer, E. P. Jastram, Director, A. N. Dana, Secretary and Assistant Treasurer, Miss Florina Levesque (for the Winding Department), Mr. Earl E. Greene, Jr. (for the Dye House), Mr. Thomas Anderson, Sr. (for the Mechanical Department), and Mr. Charles Collins, Paymaster and oldest employee in length of service now with the company.

Mr. Collins spoke for the Accounting Department and also presented a handsome silver service, suitably engraved for the occasion, to the guest of honor, Mr. Traver, on behalf of all the employees; and a beautiful bouquet to Mrs. Traver.

The members of the dinner committee were as follows:—J. M. Wood, Chairman, Evelyn MacLachan, Sec., Austin F. Matthews, Treas., Thomas Anderson, Sr., E. Ivan Brown, Ernest Boudreau, Antonio Castellone, Clinton W. Dawson, Earle E. Greene, Jr., John F. Heran, Wm. J. Laas and Mary N. Giddall.

A chronological history of the Franklin Process Company would record the following dates: *1908*—company formed for the purpose of manufacturing a new type of package dyeing machine and called the

W. A. Traver

Franklin Process System of Dyeing and located on Promenade Street in Providence; *1910*—company incorporated; commission yarn dyehouse started, utilizing the Franklin Process System; *1919*—first branch plant started in Philadelphia; *1920*—the Providence plant moved to its larger and present quarters on Eddy Street; *1921*—second branch plant started at Greenville, S. C., and called the Southern Franklin Process Company; *1923*—a cotton yarn spinning mill established in Fingerville, S. C., and called the Franklin Process Spinning Mill, Inc.; *1925*—third branch plant established in Chattanooga, Tenn., and called the Central Franklin Process Company.

Each of these plants today has been enlarged from the original size and together make the Franklin Process Company one of the largest commission yarn dyers in the world.

• NATIONAL CHEMICAL EXPOSITION

New discoveries and developments in the service of chemistry and its application and progress in many fields of activity will be discussed by foremost authorities in America at an Industrial Chemical Conference, which will be a feature of the National Chemical Exposition to be held December 11 through 15 at the Stevens Hotel in Chicago.

Announcement is made that the directors of the exposition, sponsored by the Chicago Section of the American Chemical Society, believe that its objectives may be enhanced by furnishing the latest scientific information as well as practical education that will result from a visit to the exhibition.

"We have arranged for this Industrial Chemical Conference an excellent program of papers in the nature of symposia on 'Newer Developments in Chemistry and Chemical Engineering,'" said Dr. R. C. Newton, chairman of the show committee. "The program is timed to afford those who wish to hear the talks in which they are interested ample opportunity also to view the show."

Technical sessions for this conference have been arranged for Thursday afternoon and evening, December 12; Friday forenoon, December 13, and Saturday afternoon, December 14. The regular monthly meeting of the Chicago Section of the American Chemical Society will be held on Friday evening, December 13.

Dr. Newton states that in addition to speakers there will be a number of interesting new films shown on a variety of subjects. It is planned to set aside a room for frequent showing of a number of films which should be of interest to those attending the exposition.

The show committee estimates that approximately 40,000 chemists will attend the exposition and conference, including chemists, chemical engineers, operating engineers, production managers, plant superintendents, buyers and company executives. Exposition floor space is limited to 38,000 square feet, more than 75 per cent of which has already been assigned, it is reported.

Information regarding the program and applications for space should be addressed to the National Chemical Exposition, 110 North Franklin Street, Chicago.

• TEXTILE-FINISHING APPOINTMENTS

Because of competition for maximum efficiency and for more perfect production with economy, modernization of methods and machines in the textile industry develops more and more along individual lines. The "good old days" of standard practices, of standardized machines—at standardized prices, cannot be found on today's calendar. The best of these machines are surviving; but to supplement them in almost every instance of modernizing, mill managers conceive new methods that usually mean especially designed machinery and, in some cases, the development of entirely new machines.

Recognizing these facts, and believing that modernization begins at home, the Textile-Finishing Machinery Co. has changed its whole plan of operation to conform to these new conditions. It has added, or promoted, men of proved capacity and ability to direct operations and service in accordance with its new policy.

The company anticipates enthusiastic reception by the trade of its announcement of the appointment of Thomas Harris as General Manager. His ability and resourcefulness long have been recognized in the trade where his experience covers ten years as superintendent with Manville-Jenckes Corp., of Tamarack Mills Nos. 1 and 2, in Pawtucket; at Globe Mill, and then as General Superintendent of the

Thomas Harris

Social, Nourse and Globe Mills in Woonsocket.

After these years as superintendent, he organized the Harris Textile Machinery Co., Providence, where he developed special machinery for a number of new products in the industry.

Wallace Taylor

To equalize the new production policy, the company has promoted Wallace Taylor to the position of Sales Manager with greatly increased authority over what he enjoyed as Acting Sales Manager. In practice, he will be more of a service manager than sales manager. He is well experienced to operate along this line because of his technical schooling which began in Europe and was completed at Lowell Textile Institute in this country. Before joining Textile-Finishing Machinery Co., he had fifteen years of plant experience in textile finishing and has observed and noted the best practices in Europe and the Americas.

Naturally, these and other appointments, indicate a new trade policy for the company. Its standard machines will be continued, of course, because they have won an enviable position in the industry. But, under these new conditions, standardized machines are no longer all-sufficient. The company's new policy will be to cooperate in the designing and construction of special machines for individual requirements—which it is already doing, while continuing to modernize its standard lines of finishing equipment.

● MICHIGAN ALKALI BOOKLET

The Michigan Alkali Company, 60 East 42nd St., New York, N. Y., has recently issued a booklet entitled "Wyandotte Caustic Soda" which contains data and charts which are being published for the first time. Also included is an historical sketch of the company and a story of the manufacture of caustic soda. The booklet should be of interest to anyone using caustic soda.

● GENERAL RELEASES

General Dyestuff Corp., 435 Hudson Street, New York, N. Y., announces release of circulars describing the following products:—

Direct Brown G—a direct dyestuff suitable for the dyeing of cotton, rayon and other vegetable fibers in their various stages of manufacture, producing red brown shades said to be of good fastness to acetic acid, alkali and ironing. Circular G-193.

Katanol W B Conc.—a new auxiliary for dyeing union fabrics which is a reserving agent for the animal fibers. It is said to combine good reserving action with excellent penetrating properties which makes it particularly adapted for the dyeing of union fabrics which are tightly woven or where the cotton or rayon is highly twisted, and where the animal fiber is to be left clean or dyed a contrasting shade. Circular G-189.

● BY GUM!

By Gum, publication of Reichhold Chemicals, Inc., 601 Woodward Heights Boulevard, Detroit, Michigan, contains in its August-September issue an article by A. D. Smith of the Chemical Color Division entitled "A Brief History of Coal Tar Colors." Copies of this publication are available upon request.

● ROTARY FIBER CUTTER

A new Stokes-Butterworth Universal Rotary Fiber Cutter, recently announced by H. W. Butterworth & Sons Co., Philadelphia, is said to be achieving record poundage cutting fiber materials into uniform lengths for mixed spinning, flock and special processes.

The new machine is achieving speeds of 750 to 1,000 pounds per hour cutting rayon in 1½" lengths. Production in pounds per hour depends upon the weight of the material being cut and the length of the cut. Any length of cut from 1/32" to 8" can be made on the new machine. The length of cuts is said to be held very accurately. Adjustments for length of cut are made by a handwheel while the machine is running. No change gears or special attachments are necessary.

The machine is made for cutting rayon, silk, cotton, wool, flax, jute and other fiber materials.

On cuts from four to eight inches, the new machine makes approximately 500 cuts per minute on a single rope or strand. Four to six ropes can usually be fed simultaneously so that the number of cuts per minute is multiplied by four to six. On cuts from two to four inches, the new machine makes approximately 1500 cuts per minute per strand. On cuts from 3/16" to two inches, the new machine makes 3000 cuts per minute per strand. When cutting flock or any material cut to lengths less than 3/16", the new machine makes approximately 15,000 cuts per minute.

The Stokes-Butterworth Fiber Cutter is equipped with ball bearings throughout, and is designed so that knives can be easily and accurately adjusted after resharpening.

● RAYON SHORT COURSE

At a recent meeting, the Textile School faculty of North Carolina State College decided to conduct a short course giving intensive instruction in the manipulation and dyeing of rayon, during the Spring quarter of the present year. The exact date has not been determined but it will probably be during the first two weeks in May.

This course will be open to all persons connected with the textile industry. It is planned to supplement lectures and demonstrations by the Textile School faculty by bringing outstanding men in the rayon field to the college to discuss the latest developments in the throwing, weaving, knitting and finishing of rayon products.

Further details about this short course which will be designed especially for practical mill men, but also available to upper classmen in the Textile School, will be announced later.

● NYLON FOR CONSUMER USES

The bulk of nylon production is going into hosiery and other consumer uses, despite reports to the contrary, E. K. Gladding, manager of the Nylon Division of E. I. du Pont de Nemours & Company, said recently.

Rumors that large quantities of nylon are being taken by the Government for parachute fabric, belts and other military articles, thus limiting the supply of nylon hosiery, are incorrect, Mr. Gladding said.

The Nylon Division, he stated, is cooperating with Government departments and suppliers of parachute fabrics, webbing and other essential defense items to develop manufacturing specifications for use in the event of raw material shortages. However, the actual amount of nylon required to date for such work has been extremely small.

"The limited stocks of nylon hosiery in many retail stores," Mr. Gladding said, "are due to demand for the hosiery greatly exceeding the production of nylon yarn.

"The supply is being increased as rapidly as plant expansion permits. The first unit of the palnt at Seaford, Del., started only last December, reached capacity in mid-September. Work on a second unit at Seaford is being expedited. Production in the second unit is expected to start in December. Full production is anticipated probably six months thereafter."

● QUAKER RELEASE

Quaker Chemical Products Corp., of Conshohocken, Pa., has announced a newly developed organic chemical for the treatment of Gum Silk—Quaker Diapene 1033.

Quaker Diapene 1033 is not an oil but an entirely different material which is said to give outstanding and uniform results as a soaking treatment on gum silk to prepare it for knitting of full fashioned hosiery. It is stated that only thirty minutes is required, regardless of whether open tub, circulating bath or machine soaking is employed.

Quaker Diapene 1033 displaces the ordinary soluble fatty and fatty-mineral oil combinations and since only an exceptionally small amount is required to do the work, the cost of soaking is said to be lower than with ordinary type soluble oils. In addition, the quality of the finished hose is said to be greatly improved since less boil-off of grey hose is required, whether the double, split or single bath method is used.

Complete technical data and methods of application will be supplied.

● PERKIN MEDAL

Dr. J. V. N. Dorr has been elected to receive the Perkin Medal of the Society of Chemical Industry for 1941. The medal is awarded annually for valuable work in applied chemistry. The selection is made by a committee representing the five chemical societies in the United States.

Dr. Dorr was born in Newark, New Jersey, January 6, 1872. He received the B. Sc. degree from Rutgers University in 1894, the honorary degree of Master of Engineering in 1914 and the honorary degree of Doctor of Science in 1927 from the same institution.

His many inventions include the Dorr Classifier, which has been called editorially "the piece of equipment that comes nearest to being in universal use in modern hydrometallurgy," the Dorr Thickener, the Dorr Agitator and Continuous Counter Current Decantation. He is at present the active head of The Dorr Company, Inc. which he organized. He is a member of many scientific societies.

The medal will be presented on January 10, 1941 at a meeting to be held at The Chemists' Club, 52 East 41st Street, New York City. Details will be announced later.

● NOPCO STOCK LISTED

Listing of the common stock of the National Oil Products Co., of Harrison, New Jersey, on the New York Stock Exchange, was announced recently by C. P. Gulick, president and chairman of the Board. The stock has been listed on the Curb Exchange since June 24, 1936.

At present selling at 36½, the stock reached a high of 47 in 1937. The lowest quotation was 15 during the sharp recession of 1938. The company declared a dividend of 35 cents a share, payable September 26 to stock of record September 16.

Founded in 1907, the company manufactures industrial-chemical products for the textile, leather tanning, paint, varnish, ink, paper, glue, metal working, cosmetic, laundry, and dry cleaning industries, and vitamin concentrates for feeds, foods and pharmaceutical products. It is the parent company of the Metasap Chemical Co., Inc.; Admiracion Laboratories, Inc.; Vitex Laboratories, Inc.; Brown, Jeklin & Co.; and Frozen Sunshine, Inc. The company has offices and plants in Harrison, Chicago, Boston, Cedartown, Ga., and Emeryville, Calif.

In 1939 the National Oil Products Co. showed a net profit of $700,401.02. It was the 32nd annual profit for the company. The profit figure at the half way mark this year after taxes and all charges was $376,498.00.

There are 179,829 shares of common stock outstanding with more than 100,000 unissued.

● CALCO RELEASE

Exceptional fastness to acids is said to make Calcomine Fast Black F a valuable dyestuff for dyers of cotton and rayon suit linings, according to the most recent color announcement issued by the Calco Chemical Division, American Cyanamid Company.

It is stated that, in addition to having very good fastness to acids, Calcomine Fast Black F can be of unusual value to the dyer because of its versatility. By dyeing light it produces good shades of grey. Acetate in union materials is left white by this dye and application at a low temperature leaves wool unstained, making Fast Black F a useful speck dye.

The dyeing and fastness properties of this dye are fully described in Calco's folder, "Calcomine Fast Black F." In addition, swatches showing shade effects on various materials and on unions are also given in this pamphlet. Copies may easily be obtained by writing Calco at Bound Brook, New Jersey.

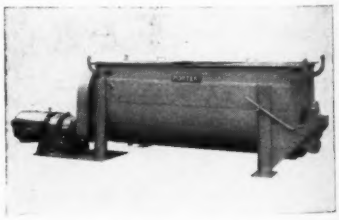
● GILL BOOKLET

"The ABC & XYZ of Spinning Roller Coverings" is the title of a textbook just issued by Gill Leather Co., manufacturers of Gilleather Roller Coverings, General Office and Plant at Salem, Mass. It is 7 x 5" in size and consists of 34 pages. Printed in two colors and profusely illustrated with charts, graphs, cross sections, etc., it deals with every type of roller covering material.

It is written as a textbook for the industry and a copy can be had by any one interested in mill production.

● MIXING MACHINES

A line of double ribbon mixing machines, designed for fast, efficient mixing of materials ranging from dry powders to heavy viscous pastes, has recently been introduced by the H. K. Porter Co., Inc., 4903 Harrison St., Pittsburgh, Pa.



Two metal ribbons, welded spirally to the inner surface of the mixing cylinder, create a positive double folding action on the materials being mixed, which is said to assure the user of perfectly mixed batches. The spirals are so placed that the mix is worked toward the discharge end of the cylinder, so that when mix is completed it can be removed easily. The mixer cylinder itself lies within a baffled jacket, for either heating or cooling by means of hot or cold water.

Additional advantages of the Porter Mixer are said to lie in the facts that the motor is mounted on the same base as the machine itself, eliminating danger of disalignment; and that the machine is fitted with anti-friction bearings and special end seals, to keep materials being mixed from the shaft. All gears and other working parts are totally-enclosed, for safe operation.

The machine illustrated is of 60 cubic ft. capacity, equipped with a 15 h.p., 440 volt, explosion-proof motor. It is available in any capacity, from laboratory to large production sizes, and may be fitted with any type motor desired. The manufacturer will be pleased to furnish additional data upon request.

• ELECTRIC EMBOSSING

A process for electrically embossing fabrics with shortcut fibers that is said to promise to develop a whole new field of decorative treatments on dress and drapery fabrics, has been perfected by Arnold Print Works.

Three years of experimentation, of which two years were in the laboratory, and a third year of actual testing of dress fabrics in the consumer field, have gone into the development of this new process, descriptively termed Fibredown. Assured of its practicality, its wide consumer acceptance, and a favorable price position, plans are now being made for the extensive featuring of this decorative treatment on a variety of fabrics in 1941. Yardage is expected to run into millions.

The Fibredown process simulates embroidery. Its superiority over other current methods for superimposing pattern on fabric is said to lie in the clear-cut, orderly beauty of the raised motif; the much greater density of fibers; the increased size it makes possible in appliqued motifs; and their pliability to easy scissor cutting. Improved sheen and good draping qualities are said to characterize the softer types of fabrics on which the Fibredown decorative process is used.

• JOINS COMMERCIAL SOLVENTS

Hillary Robinette, formerly president of the W. H. & F. Jordan Manufacturing Company, has entered the employ of Commercial Solvents Corporation. Mr. Robinette will promote the textile specialties recently introduced by Commercial Solvents Corporation.

• PRICE REDUCTIONS ON PEROXIDES

Reductions up to seven per cent in the prices of 100 volume Hydrogen Peroxide and of Sodium Peroxide are announced by The R. & H. Chemicals Department of E. I. du Pont de Nemours & Company, Inc., Wilmington, Delaware.

These oxidizing agents are widely used in the textile industry for bleaching purposes. Applications are also found in pharmaceutical, fur, straw, wood pulp and veneers, and starch and glue industries. The change also applies to a special 100 volume Hydrogen Peroxide which is prepared for the food industry.

Lower prices on these peroxides are said to be consistent with Du Pont's policy to reduce prices whenever possible, in order to stimulate new applications and expand the use of its products.

• MORTON CHEMICAL CHANGES

Joseph R. Morton, president of Morton Chemical Company, has just announced some changes in the corporate set-up of that company, together with an expansion of their sales and manufacturing facilities.

Amendment to the charter has just been approved by the North Carolina Secretary of State, authorizing the issuance of $100,000 additional preferred stock, $25,000 of which has now been subscribed and paid for and the balance may be issued when and if additional funds are desired for further expansion of facilities.

This increase in working capital will permit further expansion in the manufacturing facilities of the plant, which is stated to be one of the largest and best equipped in the South for the manufacture of organic specialties. It is planned that the company will go into manufacture of materials for trades other than textiles, the bulk of the company's business having been done up to now in that field.

Coincident with this expansion of manufacturing facilities, the company is opening a branch office in the Woodside Building, Greenville, South Carolina, and announces that Robert E. Buck of Greenville is now associated with the company and in charge of the Greenville office.

Morton Chemical Company is manufacturing a wide range of organic specialties embracing all types of finishing agents both anion and cation active; wetting agents, mercerizing assistants, synthetic detergents, and waterproofing agents, as well as their wide range of sulfonated products and sizings. New products just being placed on the market include Morpelwets N and O, these being two new primary wetting agents for use in neutral, acid, or alkaline baths; Morpelwet LC, a new rewetting agent for Sanforizing or dyeing on gray bottom; Morpeltex AL and C, two new anion active finishing compounds; and Morpeltex ADS and TS, two synthetic detergents in dry form. The company is also working on a number of other new products, including a line of finishing oils.

• FOLDER ON GLYCOLS

Carbide and Carbon Chemicals Corporation announces publication of Chemical Group Folder No. 2 on "Glycols," another of a series of folders which present the properties, uses, and possibilities of organic chemical families. In this latest folder, ethylene glycol, several polyethylene glycols, propylene glycol, and dipropylene glycol are described, and a table of reference data on commonly used physical constants and solubilities of these glycols is given.

Among the many uses for glycols are: in the manufacture of low-freezing dynamites, electrolytic condensers, liquid coolants, and anti-freeze solutions; as assistants in textile dyeing and printing; as hygroscopic agents for moistening many products such as tobacco; as heat transfer media; as solvents and plasticizers; and for producing synthetic resins, plasticizers, and emulsifiers. The folder will be of interest to those using or manufacturing humectants, solvents, anti-freezes, resin intermediates, coupling agents, and liquid coolants. Copies of the folder can be obtained by writing Carbide and Carbon Chemicals Corporation, 30 East 42nd Street, New York, N. Y.

• MODELS OF TEXTILE MACHINERY

Six models of machines designed by Leonardo da Vinci for various processes involved in the manufacture of textiles have just been added to the extensive exhibition of the famous scientist-painter's work in mechanical and industrial fields now at the New York Museum of Science and Industry, in Rockefeller Center, New York City.

The models, all of which were reconstructed in full size from original drawings and instructions found in da Vinci's notebooks, are a flying spindle, two machines for raising the nap of cloth, a cloth-shearer or nap-trimmer, and two cordage mills.

• MEETINGS, S.C.I.

The American Section of the Society of Chemical Industry has planned the following meeting schedule for 1940-41.

1940

November 15—Program on plastics. Details of meeting to be announced.

December 6—Joint meeting with American Chemical Society, New York Section.

1941

January 10—Perkin Medal Award to Dr. J. V. N. Dorr, President of The Dorr Company, Inc. Joint meeting with American Chemical Society, American Institute of Chemical Engineers, The Electrochemical Society and Societe de Chimie Industrielle. Details of meeting to be announced.

February 28—Details of meeting to be announced.

March 7—Joint meeting with American Chemical Society. Presentation of Nichols Medal by American Chemical Society.

April 18—Joint meeting with American Chemical Society, New York Section.

• OPEN FORUM •

Rules under which this department of the REPORTER is conducted are as follows:

1. Anyone who has a technical problem on which he would like advice may submit it to the reporter and it will be published in the first available issue.

2. Any reader who feels that he has a solution of the problem may forward his reply to us and if we feel that the reply is suitable it will be published in a succeeding issue.

3. For each such reply published the Reporter will pay a minimum of $2.

4. In case there is more than one answer to the same question, the one covering the subject in the most complete and authentic manner will be published, or if two answers are sufficiently different both will be published. If two answers are considered equally good, the one first received will be given priority.

5. The Reporter will assume no responsibility whatsoever for the accuracy of the answers submitted—it is simply offering a vehicle for the public expression of its readers' opinions.

6. Both the questioner and answerer must send in his complete name and address. When requested we will publish only the initials or other identifying insignia.

Question

52—We are dyeing and finishing gabardines containing 15 per cent wool and 85 per cent rayon in the warp, while the filling is 100 per cent cotton and have considerable trouble with streaky shades warp wise on the face when dyed in tan shades.

It is possible that some of the readers of the OPEN FORUM may have suggestions regarding this difficulty.—**T. M. A.**

Answer No. 2—Referring to your problem of streaky shades in your dyeing of Gabardines (Question 52), I think that I may come to your assistance in erasing the trouble.

Being almost a 100 per cent Cotton and Rayon Fabric, I would suggest to boil the goods out in 20 per cent Aqua Ammonia for one-half hour. This cleans the stock of any uneven scouring in the washer, and also has a tendency to amalgamate the warp threads into a more solid mass (without felting), at the same time acts as a resistant to the color going on too quickly. **Wash well.**

The next process of dyeing must be brought up carefully to the boil. Enter the goods at 120° F. Bring up to boil in 1 hour and let run at 190° F. to shade. The goods should come out clean, bright and very level, without any streaks showing.—**C. G. V. SJOSTROM.**

Answer No. 3—I suggest that T. M. A. try using sodium chloride brine as a leveling and exhausting agent. If he has been using anhydrous sodium sulfate, he should substitute about 65 per cent as much common salt and cut down on his acid strength as much as 10 to 20 per cent to keep the pH of the solution the same as when using sodium sulfate. If he has been using crystalline Glauber's salt, he should use only about 30 per cent as much common salt with a proportionate reduction in acid.

If he has been using dry sodium chloride, I suggest he try saturated salt brine but reduce the quantity somewhat.—**C. D. LOOKER.**

New Question

53—We should be pleased to have information concerning the block printing of yarn. Also if anyone produces special machinery for this purpose and if yarn is printed to any extent by this method. We should also like to know how extensively block printing in general is used in the United States and if there are concerns who make a business of manufacturing the necessary blocks.—**C. C. E.**

• CLASSIFIED ADVERTISEMENTS •

POSITION WANTED: Dyer on cotton warps, skeins, package machine and mercerizing. Age 34 years. Any location. Write Box No. 260, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Chemist, rayon processing man, sixteen years experience with leading organizations. Can supervise the dyeing and finishing of rayon, acetate, cotton fabrics, the chemical control, economy, research, improvements. Write Box No. 255, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.